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ABSTRACT

Research into the sign languages of the deaf is reviewed, particularly as it relates to the study and use of sign language in the Irish context. The first section offers an overview of deafness, the deaf experience, acquisition of linguistic and social identity, the sociology of the deaf community, and the role of sign language. Subsequent sections examine characteristics of and research into the following areas: sign phonology (including handshapes, place of articulation, movement, orientation, constraints on combinations of lexical items, and restrictions on combinations of sublexical components); sign morphology (including the role of classifiers, derivational morphology, inflectional morphology, and morphological modification of nouns and the predicate); and sign language as discourse using space for its structure. A 60-item bibliography is included, and appended materials include illustrations of American Sign Language (ASL) handshapes and transcription symbols, an alternative system for describing the formational properties of ASL, illustrations of minimal contrasts in ASL, a feature system for describing handshape, illustrations of derivational and inflectional ASL morphology, and ASL recursive devices. (MSE)

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TRINITY COLLEGE DUBLIN

Centre for Language and Communication Studies

Sign languages

An introduction to their social context and their structure

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Sign languages: an introduction to their social context and their structure*

by

Frank Maguire

0 Introduction

This paper summarizes research carried out into sign languages of the deaf. The importance of undertaking such a summary at the present time can be explained in two ways. First, although research reveals the existence of sign languages in many countries throughout history, it is only in the last few decades that serious research has been undertaken into their nature and structure. Secondly, for the deaf child there is a major deficiency in the channel which facilitates oral/aural language development. Since the early 1970s a growing demand for the use of an alternative means of communication for deaf children has been articulated. It is therefore time to highlight the topics that require investigation in the Irish context. This means attempting to answer questions such as: What is Irish Sign Language? Who uses Irish Sign Language? Who are the deaf? How can Irish Sign Language be investigated and described? How is sign language acquired? This paper cannot provide full answers to these questions, but it can point researchers in likely directions by mapping out some of the ground covered by international research.

The paper begins with a brief overview of deafness, deaf experience, the acquisition of linguistic and social identity, the deaf community, and sign language, so as to place sign language research in context. It then summarizes the findings of research into sign phonology, sign morphology, and the structuring of space for discourse and syntax.

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1 The background of deafness

1.1 The deaf

Much of the confusion in research dealing with deaf people arises from incomplete descriptions of the subjects under consideration and from generalization across dissimilar populations. The term "deaf" distinguishes people who must process language primarily by eye from those who can process it primarily by ear (see Quigley and Paul 1984, p.230.) Five descriptive variables help to distinguish a number of subgroups within the population described as hearing-impaired: (1) degree of hearing loss; (2) age at which hearing loss occurred; (3) type of hearing loss; (4) cause of hearing loss; (5) hearing status of parents (Quigley and Paul 1984, pp.1f.).

The degree of hearing loss is usually described in terms of hearing threshold levels (HTL) for pure tones at each octave point between 250 and 8000 Hz. A threshold of intensity measured in decibels (dB) is obtained at each frequency tested. A person's degree of hearing loss can be described by a single number, a pure tone average (PTA), which is the average threshold response at 500, 1,000, and 2,000 Hz for his better ear. Hearing classifications are based on hearing loss, as defined by the better ear pure tone average. These are: normal hearing (-10dB to 27dB), slight loss (27dB to 40dB), mild loss (40dB to 55dB), marked loss (55dB to 70dB), severe loss (70dB to 90dB) and profound loss (90dB and more). Individuals who have a profound loss (greater than 90dB) are considered deaf (for details see Rintelmann 1979, Deutsch and Richards 1979).

The age at which hearing loss occurs is very important from the point of view of language development and education. The terms "prelingually deaf" and "postlingually deaf" refer respectively to the onset of hearing loss before and after the establishment of language at about the age of three years.

There are four different types of hearing loss, "conductive", "sensorineural", "mixed", and "central". A conductive hearing loss may be medically remediable. Sensorineural hearing loss is the result of damage to all or part of the cochlea. A mixed loss comprises both a sensorineural and a conductive loss. Central hearing loss is the result of damage to the hearing mechanism anywhere from the eighth (auditory) nerve to the cortex.

The cause of deafness can be "endogenous" or "exogenous": either the result of some biological cause or process, or the destruction or blocking of some area of the auditory mechanism by an accident or a foreign agent.

It is very important to understand the effect that the hearing status of the parents of a deaf child can have on the child's language acquisition and general development. The hearing status of the parents is not, of course, the only

contextual variable of relevance. However, its inclusion reflects its particular importance. It could lead naturally to an examination of other environmental factors influencing language development in a deaf child.

It should be noted that the foregoing description of deafness is based on what Lane (1984, pp.134f.) would describe as the medical model. Another view of deafness sees it as the badge of a minority community with its own language and culture (Kyle and Woll 1985, pp.5-23; LeMaster 1990, pp.21-41). Indeed, because of their minority status, one could describe the deaf as forever foreigners in their native land.

1.2 Deaf experience

Corker (1990a) suggests that language and experience cannot be divorced. She holds on the one hand that without language, experience would not be expressed, and on the other, that without experience there would be no language or communication. So in a real sense it could be argued that sign language represents deaf people's creative response to the experience of profound deafness — a response that both arises from and facilitates the development and expression of self-image and identity.

To get some insight into the dichotomy between a "hearing" and a "deaf" experience, Corker's six papers, published in 1990 under the title "Deaf Perspectives on Psychology, Language and Communication", are well worth reading. She hypothesizes (1990a, p.9) that "Auditory experience is dominant for speaker-hearers, and this dominance is expressed in the language that they use." Likewise, sign language expresses the real experience of deaf people. Sound in its many manifestations is no part of that experience. So, as Corker (1990a) maintains, the quest for correct linguistic form could be running in the opposite direction to deaf people's search for a relevant language to explain the meaning of their world.

1.3 Acquiring linguistic and social identity

All children, including deaf children, need the same basic life-enhancing goods. They need love and acceptance, communion with their fellows, opportunities to explore and discover. Before these needs can be met for the deaf child, however, adjustments need to be made in the environment. Care must be taken with these adjustments lest they become the focus of the interaction with the child. All should be seen as tools to help achieve the essential tasks of childhood (Erting 1988, p.216).

Yet, since one of the primary aims of education has been the development of the oral language of the community as the preferred means of communication, people who do not communicate through speech may be regarded as

strange and inferior. When such people succeed in developing their own language, differing in medium and form from the accepted norm, then the majority language group in society tends to ascribe to them a linguistic competence well below that of the rest of the community. The deaf can be one such group, set apart as inferior by the majority hearing community.

However, within the last few years, a growing international concern for human rights has led to a more enlightened approach to the deaf as an ethnic minority. This approach is gaining momentum within Europe and having a positive influence on the education of the deaf. Now, rather than being stigmatized as educational failures within the mainstream, the deaf can be viewed in a new light by educators and researchers alike (Kyle and Woll 1985, p.5). Kyle and Woll (*ibid.*, pp.6f.) highlight the different approaches to understanding deaf society: the clinical-pathological approach (usually taken by hearing people, and based on psychological or educational data), and the cultural approach (usually taken by deaf people themselves and linguists, and expressed in terms of the unifying factor of a shared sign language). Baker and Cokely (1980) point out that these are not simply differences of approach; they have deep implications for the way deaf people are treated. The clinical view stresses what is lacking in deaf people and adopts the "normalization" of deaf people as its goal. The cultural approach, on the other hand, implies acceptance of deaf people as an ethnic minority with their own community and traditions (Kyle and Woll 1985, p.7).

1.4 The deaf community

International evidence shows that deaf communities have a unique structure (see Kyle and Woll 1985, pp.9-23; Miles 1988, pp.8-43). They are sociologically complex; they do not form a geographical nucleus, and their members are unlikely to live in the same area of any particular city; they do not work at the same locations; they have limited access to the media controlled by the dominant hearing community; they meet only a few times a week, usually in the evenings; and they live a lot of the time in a hearing world. Kyle and Woll (1985, p.10) point out that this produces a community pattern which is rather fragmented as regards the time spent together but closely bonded by friendship and greatly strengthened by the tendency of community members to intermarry. Kyle and Woll (*ibid.*, p.22) note that the "factors contributing to centrality of community membership" are commitment and the audiological, political, linguistic, and social features of deafness.

1.5 Sign language

The language of the deaf community is sign language, which uses the

medium of space rather than sound. It is perceived through the "listening eye", and produced by movement of the upper body. It is a manual/gestural system of communication. Bochner and Albertini concluded that American Sign Language (ASL) is a Creole, and, more importantly, that it is acquired through a process analogous to creolization (Bochner and Albertini 1988, p.14; see *ibid.*, pp.3-48, for development of this theme). Edwards and Ladd (1983) looked at the parallels between the structure of British Sign Language (BSL) and West Indian Creole, both minority languages used in Britain, and proposed changes in the education of deaf children on the basis of experience with West Indian Creole-speaking children. So, if one wishes to research Irish Sign Language and its acquisition and development, one could benefit greatly from an awareness of the trend of viewing Sign Languages as Creoles that is gaining acceptance among some of the world's leading researchers in this field.

2 Sign phonology

As with the spoken word, we might look at signs from several different perspectives, including the phonological (cherological), the morphological, the syntactic and the semantic (Brennan et al. 1984, p.1). Stokoe and Kuschel (1979, p.6) state:

> Bellugi and other investigators have presented enough corroborative evidence for Battison to have concluded in 1974 that the term phoneme is appropriate for the submorphemic elements of ASL because the kind of rules governing this signed language is not different from the kind of rules that govern the phonology of spoken languages.

But this statement is not to be taken as settling the question for all the sign languages that may exist. Stokoe and Kuschel point out that some sign languages may indeed have a level of sub-morphemic elements, others may not. Moreover, they maintain that while the phonemes (or cheremes) of ASL have been identified (if somewhat differently by different researchers), the full phonology of gestural languages is not known and there is only partial knowledge of the phonology of one or two (Stokoe and Kuschel 1979, p.7). So, with that very serious caveat in mind, let us examine the approaches that research has taken in the area of cherology.

From the cherological perspective, signs are seen to be subject to physical, perceptual, and linguistic constraints. They are also seen as a combination of several features or parameters. From this perspective, the focus is on the manual aspect, the organized activity of the hands. Stokoe (1960) used a

structural linguistic framework to analyse sign formation. This approach emphasized three "parameters" that are combined simultaneously in the formation of a particular sign (what acts, where it acts, and the act itself). These three "parameters" or "primes" translate into the handshape, the location, and the movement of a sign. Stokoe referred to the handshape as the "designator" (DEZ), the location as the "tabulation" (TAB), and the movement as the "signation" (SIG). The notational system that Stokoe developed for writing signs contains symbols for each individual handshape, location, and movement (Wilbur 1987, p.20 — see also Hoemann 1978, pp.5-10; Klima and Bellugi 1979, pp.38-40; Brennan et al. 1984, pp.3-4; Kyle and Woll 1985, p.89; Poizner et al. 1990, pp.3-10). Appendix A, reproduced from Wilbur (1987), shows ASL handshapes, the American manual alphabet, and Stokoe's notational system; while Appendix B, reproduced from Friedman (1977), gives an alternative system for the formational properties of ASL.

After Stokoe, other analyses of sign language formation suggested additions to the three basic building blocks — handshape, location, and movement. One major parameter, orientation of the palm, was suggested by Battison (1973; Battison et al. 1975). Other formational elements that are needed to provide a full description of a sign include the contact of the signing hand with another part of the body (including the other hand), the direction of the movement, the speed of signing, the tension in the signing hand, the size of the path of the sign, facial expression, gaze, and head tilt, nod, or shake (Wilbur 1987, p.21; see also Brennan et al. 1984, pp.4-9; Friedman 1977, pp.13-56.)

To recapitulate: a sign is a hand or hands in a particular configuration moving in a specified way with respect to a particular locus or place, and these values co-occur in time in constituting the sign. This description, however, pertains to the structure of lexical signs only — the basic vocabulary items of the language — as they would be made in citation form (Klima and Bellugi 1979, pp.41-43; see figs. 2.2, 2.5 in Appendix C). As stated above, to fully describe a sign and distinguish it from all others, it is necessary to specify more information about additional formational aspects.

2.1 Handshapes

The first major parameter of the structure of lexical signs is handshape (see Appendix A). After Stokoe a number of approaches to the topic of handshape developed. Lane et al. (1976) base their description of the features of handshape on whether the fingers and/or thumb make a fist or are extended. Compact hands are closed, with no extended fingers; broad handshapes have three or more fingers extended. In this feature system, a handshape cannot be

both compact and broad. Other features contrast in this system, but as Wilbur points out, "these features are perceptually descriptive and their utility in the formation of phonological rules has not yet been tested" (1987, pp.41-43).

Woodward's (1973) features are based on articulatory characteristics. Ten features that can describe 40 handshapes are defined in this system (see Appendix D).

Kegl and Wilbur's (1976) attempt to determine a set of distinctive features on the basis of articulation, perception, and theoretical descriptive utility is discussed by Wilbur (1987, pp.43-44.)

Smith (1990, p.15) gives a number of the most common handshapes in BSL. And, although handshape is one of the distinctive features at the sublexical level of sign structure, there does appear to be some influence from iconicity which links this and other features with meaning (see *ibid.*, pp.23-58). It would be wrong, therefore, to hold that the visual and spatial aspects of iconicity have no effect on sign language at a sublexical level. As Smith (*ibid.*, p.23.) says:

> Some signs are very obviously iconic [...] and represent objects by giving a visual description of their shape. Curved fingers are commonly used to indicate curved objects, and occur in ball and bottle, to indicate the curved surfaces of these objects. Flat hands are commonly used to indicate flat objects, and occur in book, box and table, to indicate the flat surfaces of these objects.

2.2 Place of articulation

The second major parameter of ASL lexical signs is the locus (TAB) of a sign's movement, its place of articulation. The primes of place of articulation are defined with respect to particular locations and areas on and around the body within a delimited region called the "signing space". All signs must be made within the "signing space", which extends from the top of the head to the hip area on a vertical axis and, horizontally and laterally, from the signer's extreme right to the signer's extreme left, forming a quarter sphere in front of the speaker (see figs. 2.12 and 2.13, in Appendix C; Klima and Bellugi 1979, pp.50f.; Miles 1988, p.53; Kyle and Woll 1985, p.86; Sutton 1990, pp.11-14).

Table 2-2 in Appendix A lists the Stokoe symbols for the location of a sign. Wilbur comments that, within this system, signs that did not contact any part of the body were described as being made in neutral space, a location that contrasted with the remaining eleven locations on the body. But Kegl and Wilbur (1976) distinguished signs in neutral space from signs on the body by use of a feature contact. This approach allows neutral space to be subdivided with reference to the body areas (Wilbur 1987, pp.46-48.)

Although location has been viewed as a sublexical feature, it is again

important to mention the way iconicity may influence this feature in a similar way to handshape. Smith (1990, pp.61-84) groups signs located on a particular part of the head or body. The first location she mentions is the forehead — the mind area. She holds that most signs connected with mental activity are made on, or start from, the forehead. She points out that signs connected with looking or sight usually start from the eye or eyes, those connected with hearing or sound are usually made near the ear, and those concerning speech in its many varieties start from the mouth. She also claims that signs located on the body usually express affections, desires, personal qualities, physical feelings, and behaviour (*ibid.*, p.61).

2.3 Movement

The third major parameter of sign structure, movement (SIG), is its most complex aspect and has been the most difficult to analyse. As in forming handshapes the hands are highly articulate and capable of assuming a vast array of distinguishable static shapes, so the hands and arms are even more versatile in producing distinguishable movements and movement contours in space. But, just as the formational system of sign language limits the number of handshapes to relatively few out of all the physical possibilities, so it restricts the set of movement types. For if the movements of signs are compared as global wholes, the differing shapes, tempos, directions, oscillations, and dynamics of the motions appear extremely rich and varied. Nevertheless, the movement parameter of signs can be described in terms of distinct SIG components which can occur singly, in sequence, or simultaneously within single monomorphemic signs. Friedman (1977, p.27) points out that Stokoe describes the movement parameter in terms of the following distinctive elements:

> [...] upward movement, downward movement, up-and-down movement, rightward movement, leftward movement, side-to-side movement, movement toward signer, movement away from signer, to-and-fro movement, supinating rotation (palm up), pronating rotation (palm down), twisting movement, nodding or bending action, opening action, closing action, wiggling action of fingers, circular action, convergent action (approach), contactual action (touch), linking action (grasp), crossing action, entering action, divergent action (separate), and interchanging action. [The symbols for writing the SIG elements are given in Table 2-3 in Appendix A.]

Friedman is particularly concerned with the kinds of motion the hands and arms are capable of, the movements that specifically occur in ASL, and the interrelation of those movements within the structure of the language. This leads her to analyse the movement parameter in terms of four fundamental

aspects of movement: (1) whether, if both hands move, they interact; (2) whether the hand makes contact with the body; (3) the direction of movement; (4) the manner of movement (Friedman 1977, pp.27-34).

2.4 Orientation

The most disputed parameter of sign structure is orientation. Friedman (1977, p.43) says that the components of the orientation parameter describe the relation in space of the hand to the signer's body. She states that orientation has to be defined for each handshape, so that we know which part of the hand is "facing" which direction in relation to the body. She gives her arguments for including orientation (pp.43-49). It is true that many researchers do not include orientation as a major feature in sign cherology; but as Supalla and Newport (1978, p.93) point out, Stokoe's notational system does specify orientation for each sign by a subscript on handshape.

2.5 Constraints on combinations of parameter values

In summary it can be said that, for American Sign Language, a sign consisting of a single unit can be analysed as a simultaneous combination of a particular DEZ, a particular TAB, and a particular SIG. For a full description of a sign that distinguishes it from other signs, its particular contacting region, orientation, and hand arrangement must be specified, together with qualities of movement. Each of these formational parameters has only a limited number of values that are realizable in particular signs in ASL (Klima and Bellugi 1979; Wilbur 1987).

Yet it should be stressed, as Klima and Bellugi (1979, p.65.) conclude, that

> Our knowledge of constraints on the combination of formational elements in ASL is yet very limited; nevertheless, it is clear that there are restrictions on the formation of the lexical items of ASL [...]. The extent to which these constraints are characteristic of all sign languages or special to ASL, is not yet known.

2.6 Evidence for a sublexical structure of sign

Sign languages have been described as having a highly restricted inventory of elements and systematic restrictions on the ways in which sublexical components can combine. Poizner et al. (1990, pp.3-10) outline the ways that the evidence for such claims has been gathered. The approach parallels the evidence offered for the sublexical structure of oral/aural languages (see, e.g., Aitchison 1987; Fromkin 1973, 1980; Emmorey and Fromkin 1988).

Poizner et al. document their research into the language of six deaf signers who had experienced strokes impairing either the left or the right side of the brain. They examined, among other things, the effects that aphasia has on the

sublexical structure of sign (Poizner et al. 1990, pp.42, 46f., 82-85, 116, 147-149). Treated with caution and taken in conjunction with evidence from other sources, the errors of aphasic patients can help to illuminate research into the sublexical structure of sign.

Other evidence for the sublexical structure of ASL comes from slips of the hands (Klima and Bellugi 1979, chapter 5), which like slips of the tongue give insights into language structure. Poizner et al. (1990, pp.5-8) give examples of slips of the hands which affect handshape or location or movement, keeping all other parameters the same. From the evidence presented, Poizner et al. conclude (*ibid.* p.10):

> There can be no doubt that both types of language system — sign and speech — reflect similar underlying principles. It is important to note, however, that signs and words do not have the same internal structure in all respects. Their sublexical units combine differently in the formation of morphemes. The elements that distinguish English words from one another appear in contrasting linear order; the elements that distinguish ASL signs are preferentially arrayed concurrently in a layered structure. The predominance of concurrent layering, however, is most evident in the morphological processes found in ASL.

3 Sign morphology

Having discussed signs in phonological terms, it is now necessary to consider what Wilbur describes as the productive lexicon of sign language (Wilbur 1979, pp.81-109; 1980, pp.15-19; 1987, pp.85-137; see also Friedman 1977, pp.36-37; DeMatteo 1977, pp.116 ff; Klima and Bellugi 1979, pp.195-315; Kyle and Woll 1985, pp.131-155; Brennan et al. 1984, pp.182-185). Poizner et al. (1990, p.10) use the term "three-dimensional morphology". From reading the literature cited here, it appears that, in sign languages, systematic relationships exist between phonological specifications and morphological and lexical meanings. To understand these relationships several linguistic terms need to be explained.

The term "predicate" in sign language refers to a verb form that may include information about its subject, direct object and/or indirect object, as well as information usually represented in English by prepositional phrases and adverbs. This morphological packing of the predicate seems to facilitate the expressing of a proposition in the proper time scale for the human memory (Klima and Bellugi 1979, pp.181-194). Thus while signs are produced at half the rate of words, the rate of producing propositions does not differ in the two modes. According to Klima and Bellugi (1979, p.194) the evidence suggests that:

> Cognitive processes underlying language might well create an optimal production rate for propositions, regardless of language mode. Under such temporal pressure, a relatively slowly articulated language of signs might well exploit the possibilities of simultaneous elaboration of meaning which exist in the visual-spatial mode.

So in a sense one might say that the predicate is the message, for it contains in its many morphemes much of the information that is contained in independent lexemes in spoken languages such as English.

The term "argument" refers to the nouns in a sentence that perform a grammatical function with respect to the verb. The term "classifier" refers to a particular kind of pro-form which provides additional information about its referent.

3.1 Classifiers

According to Wilbur the presence of classifiers in ASL was initially reported by Frishberg (1975). Since this initial identification, classifiers have received considerable attention in the literature on ASL structure. Kegl and Wilbur (1976) developed the idea of classifiers as handshapes that function as pro-forms in combination with predicates. Others have discussed classifier function in the creation of locative predicates (Liddell 1980; McIntire 1980), their use in metaphorical themes with ASL verbs (Gee and Kegl 1982), and their potential use to identify up to two of the different arguments of ASL predicates (Gee and Kegl 1982; Supalla 1982, 1985).

ASL would be seen as a predicate classifier type language, as the classifiers in ASL contribute to the construction of the predicate rather than the noun phrase. Thus, as Wilbur points out, in ASL classifiers do not occur in the noun phrase, but rather as part of the predicate construction, combined with the verb. Thus in ASL, "give a bottle" would require the verb "give" to be constructed with the classifier meaning "curved exterior", whereas "give a book" would use a classifier for "flat, movable object". The forms of the verb "give" change because the classifier determines the handshape, and "give" specifies the movement (Wilbur 1987, pp.87f.). The idea of classifier is discussed, in various contexts, in a number of further papers and books on sign languages (Gee and Goodhart 1988, pp.58-69; Lillo-Martin 1988, pp.164, 176, 179; Erting 1988, p.101; Kyle and Woll 1985, pp.132-135; Miles 1988, pp.72-76, 91, 96, 115, 117; Brennan et al. 1984, p.185). Kyle and Woll compare sign language classifiers to the classifier system of Navaho, an American Indian language. Classifiers are noted in ASL and BSL. From discussions I have had with members of the Irish deaf community, I believe that classifiers are also used in Irish Sign Language.

Through the use of space coupled with classifiers, sign languages can compress much information into single sign forms. Klima and Bellugi show how a five-word ASL utterance can express a fifteen-word English one (Klima and Bellugi 1979, pp.190ff.).

However, having said what classifiers are, it remains to explain how they function. Klima and Bellugi have argued that classifiers are manipulated to show spatial locations and arrangements, and manners, directions, and rates of movement. Classifiers can reflect, for example, the path and manner in which a person, animal, or object moves from one place to another — leaping, loping, meandering, stumbling, weaving in and out, winding, moving up, down, or across. So some ASL signs can be manipulated in ways that make them mimetically mobile (Klima and Bellugi 1979, p.15).

Thus we see that classifiers, which are represented phonologically as handshapes, cannot stand alone as signs in their own right. They must be combined with other morphemes that provide the additional phonological specifications of movement, orientation, location, and so on. While predicate roots can provide some of these characteristics, verb agreement may provide others.

The combination of productive predicate and classifier forms is one way that novel signs are constructed to fit specific situations during a discourse. This use of classifiers leads to the idea of a "lexicon in flux"; though, as Wilbur (1987, p.100) points out, some of these productive forms may eventually become fixed in formation and meaning, creating a new frozen lexical item.

3.2 Derivational morphology

According to Wilbur, processes that create new lexical items do so by compounding, by idiomatic or regular derivation, and by fitting new forms into an existing pattern for noun/verb pairs (see Wilbur 1987, pp.100-104; also Appendix E). Mentioning the research into ASL compounds that has followed on from Klima and Bellugi's work, Wilbur (1987, p.102) goes on to discuss the research into what is termed "idiomatic derivation". This process produces new signs whose meanings are not predictable from the meanings of the original signs from which they are derived (*ibid.*, pp.102f.).

Supalla and Newport investigated the relationship that exists between certain noun and verb pairs. They point out that the verbs in question have a large path movement with continuous, hold-final, or restrained offset, while the nouns are all restrained with short repetitions (Supalla and Newport 1978, pp.99-110; see also Isenhath 1990, pp.32-36).

3.3 Inflectional morphology

Yet whether a sign is a frozen lexical item or is created by one of the productive processes mentioned above, it can still undergo further morphological modifications (Wilbur 1987, pp.115-137). Moreover, as one might expect, because of the medium of the language, the functions of morphological inflection in sign languages are much more extensive than in English.

Klima and Bellugi (1979, pp.198-315) give a number of categories of morphological modification. They include morphemes for indicating number, distributional aspect, temporal aspect, temporal focus, manner, and degree. Another feature of sign modification is how several of these morphemes can be used at the same time. This multiple marking is made possible because some of the modifying morphemes are spatial in nature, whereas others are created by temporal rhythm and dynamic changes (Wilbur 1987, p.115).

Wilbur (1987, pp.118-137) illustrates the variety of morphological processes that a single sign may undergo in order to convey further information about the nouns that function as arguments and the manner in which verb activity is performed. Spatial locations, changes in direction of movement, vertical and horizontal movement, and geometric contours (lines, arcs, circles and such) facilitate various information to be represented with respect to the nouns that function in grammatical relations (subject, direct object, indirect object). Speed, rhythm, size, and tension all convey pertinent information about the predicate itself (Wilbur 1987, p.137). Hence, as Wilbur et al. (1983) argue, the inflectional processes in ASL, can be divided into two basic groups: those that affect the rhythmic and dynamic qualities of the movement, and those that affect the spatial arrangement and/or location of the movement. Wilbur maintains that what she calls this "phonological split" parallels a split in morphosyntactic functions: the rhythmic/dynamic modifications affect the meaning of the predicate itself, while the spatial arrangement/location changes affect the arguments of the predicate. Because of this "phonological split", Wilbur states that it is possible to mark a single predicate with information from both groups (Wilbur 1987, p.131).

3.4 Morphological modification of arguments

Nouns are subject to only a few morphological modifications. In discussing these, Wilbur highlights research into verb agreement, reciprocal inflection, number agreement, and quantification as functions that can be indicated by particular spatial locations or arrangements. She holds that these functions provide information about the arguments of the predicate in the sentence. These modifications are marked directly onto the predicate (Wilbur 1987, pp.116-124). Wilbur (*ibid.*, pp.124f.) goes on to paraphrase the generaliza-

tions formalized by Jones and Mohr (1975) on the modifications that ASL nouns undergo to form plurals.

3.5 Morphological modification of the predicate

It appears that, in contrast to nouns, the predicate in ASL is subject to a variety of morphological modifications. These modifications would fulfil functions similar to those performed in English by adverbs, prepositional phrases, aspectual verb markings, and quantifiers. The modifications are seen as changes in the rhythmic and dynamic patterns of the sign movements. They include differences in rate of signing, degree of tension, rhythm states, size of the path, and manner of execution.

Wilbur (1987, p.128) states that the functions served by these morphological modifications vary from adverbial comments about an activity (facilitative, intensive, approximative), to information about the start or finish of an action or state of affairs (inceptive, resultative), to formal aspectual markings (continuative, incessant, durational, iterative, habitual). (See also Appendix F.)

Many researchers emphasize that multiple marking is a very common occurrence in the inflectional morphology of ASL (Klima and Bellugi 1979, pp.302-314; Wilbur 1987, pp.131-133; Poizner et al. 1990, pp.14-16.) They all use the example of the verb "to give" to explain the processes involved. Under the heading "Recursive Rules: Nesting of Morphological Forms", Poizner et al. use Figure 1.7 (see Appendix G) to explain the processes.

This section on sign morphology should have shown that any researcher who attempts to treat the sign as an unanalyzable whole could be missing numerous internal regularities that convey much grammatical information.

4 Structuring space for discourse and syntax

From a "top down" point of view, it is now necessary to look at some research that attempts to describe sign language in terms of discourse in space. For, as Poizner et al. (1990, p.16) point out, the most distinctive use of space in ASL has to do with syntax and discourse. It is difficult to analyse the grammar of sign language without an awareness of the use of points of space as grammatical devices within the sentence and as discourse devices across sentences. There seems to be a closer relationship between discoursal and grammatical devices in spatial structuring than there is in sound structuring. So one should be forewarned of the possibility of the dangers of confusing discoursal and grammatical devices.

4.1 Knowledge of sign language

Knowing a sign language, or indeed any language, must mean more than knowing its vocabulary. It must mean being able to create unique, meaningful, grammatical sentences and being able to distinguish between grammatical, ungrammatical, and ambiguous structures. Knowing sign language means more than collecting a sackful of signs. It means being able to exploit the language for effective communication (see Austin 1962; Searle 1969; Brown and Yule 1983; Fasold 1990). Yet this may be the kind of knowledge that is available only to native speakers, people who have acquired the language as their "mother hands". But 90% of deaf persons are not native users of sign language (see Wilbur 1987, pp.227-246; Kyle and Woll 1985, pp.5-23). The vast majority of deaf persons had hearing parents who did not know or use a sign language with them when they were infants and young children. It was only when they entered a residential school and associated with other deaf students, some of whom were the children of deaf parents whose first language was sign, that most deaf persons began to communicate in sign.

4.2 Sign and space

If word order is a major structural feature in the English language, then spatial organization seems to perform a like function for sign language (Poizner et al. 1990, p.17). English relies on an auditory channel which deals with its signals in a sequential order, while sign is served by a visual channel using simultaneous signals as its source (Siple 1978, p.10).

How does one describe the structuring of space that facilitates the grammar of sign language? Research has highlighted the existence of a well-defined region relative to the signer's body (Friedman 1977, p.44; Miles 1988, p.53; Poizner et al. 1990, p.19). The use of this space differentiates between pantomime and sign among other things. Hoemann states that most signs are executed between the waist and a point just above the forehead and within easy reach of the signer, left and right. Moreover, he holds that signs are executed in front of the body, within a comfortable distance, with bent elbows. Thus signs are executed in the region that is most comfortable for the signer. Constraints based on human physiology affect the articulation of signs. Also, using this sign space allows the signer to accommodate himself to the structural features of signs (Hoemann 1978, p.61). Furthermore, as Siple observed, if the body dynamics of the signer have an effect on the formation of signs, so too may the receptive needs of the addressee of sign language (Siple 1978, pp.9f.; see also Isenhath 1990, pp.83-100).

Hoemann (1978, pp. 61-63) suggests a number of variables that affect the sign space or may violate its normal constraints, e.g. the size of the signer; the

number of his audience (is he shouting?), the speaker's intent; contacting a third party without interrupting a conversation; displacement for rhetorical effect; informality of use.

4.3 The structuring of space

Research into the organization and structuring of space in sign language shows that it is used for many different grammatical and discoursal purposes. The first thing that needs to be emphasized from both the descriptive and the acquisitional point of view is the following: if one wishes to refer to an object or person present in the immediate environment, one needs only to point to it. But this is true whether one is using speech or sign. However, sign languages use arbitrary points in space for deixis and anaphora and as pro-forms in place of absent persons and things. These spatial points act as discourse devices that appear to have the same potency that pro-forms have in spoken languages (see Lyons 1979, pp.88-103).

How sign languages deal with the problems in discourse raised by Brown and Yule (1983, pp.190-222, but especially pp.201-204) has, to my knowledge, not been properly examined. The concepts of "staging" and "story grammars" (Brown and Yule 1983, pp.125-152; Greene 1986, pp.33-50) might give a functional background to the study of discourse in sign because research highlights a very complex scheme for organizing referents in space around the signer (Mandel 1977, p.76; Edge and Herrmann 1977, pp.138-143 and 175f.; Liddell 1978, p.68; Klima and Bellugi 1979, pp.276-279; Wilbur 1987, pp.117ff., 153f.; Poizner et al. 1990, pp.16-21; Isenhath 1990, pp.125-135).

Hoemann states that once a referent has been included in the spatial organization that is built for a story and has, therefore, been given a location on this imaginary stage, pointing to its location for an imaginary referent has the same effect as pointing to the referent itself, as if the referent were physically present. This simple statement, however, does not fully explain the complicated use of the device. If, for instance, the referent is mobile, the direction of the point may shift as the referent changes location during the action portrayed. This shows that it is not really a location itself that is the object of the pointing sign but an imaginary object at that location (Hoemann 1978, pp.65-66). Moreover, Poizner et al. state that, while it appears that the referential system is fixed in which objects are allotted their own points in space until "erased", the spatial framework can shift. When the shift takes place, the whole spatial plane rotates (Poizner et al. 1990, pp.19f.). Kyle and Woll (1985, p.138) and Miles (1988, pp.88f.) make reference to this type of device in BSL. Many members of the Irish deaf community have assured me

that speakers of Irish Sign Language structure space in similar ways for similar purposes. With the stage thus set for discourse narrative, sign languages use this spatial organization to perform functions similar to those that bind the sound systems of spoken languages to meaning.

To continue with the discoursal and textual aspect of sign communication, Hoemann states that points that are enumerated in speech (first, second, third, etc.) can be arranged spatially left to right, so that changing from one location to another signals that the speaker is moving on to another point. Staying in the same location indicates that the signer is still developing the same point. Other devices for highlighting movement between points in a speech that involve space in some way are a change in head position, a shift of body stance, or a change in handedness for signing (Hoemann 1978, pp.67f.).

It is also becoming clear that sign languages have the facility to separate phrases and clauses by the structuring of the signing space (Hoemann 1978, p.67). This structuring of space seems to dovetail into the non-manual components of the languages — gaze, facial expression, head nods (Baker and Padden 1978; Liddell 1978; see also Kyle and Woll 1985, pp.148-149; Wilbur 1987, pp.38-40).

Thus it may be concluded that spatial organization rather than manual coding is the basis of the discoursal and grammatical structure of sign languages. Baker and Padden (1978, pp.34f.) summarize by saying that

> [...] there is now reasonable evidence demonstrating that research on sign language structure that only looks at what the signer's hands are doing is severely limiting itself. Because of this, we need a way of systematically looking at nonmanual behaviours co-occurring with manual signs in discourse. When viewed as a language transmitted through several different channels simultaneously, the question of redundancy in ASL takes on a new meaning and suggests a very different structure than has been attributed to it up until now.

The conclusion that Liddell (1978, p.88) draws from the research is: "There can be no doubt that in ASL the hands carry only part of the language signal. In addition to the hands, the signer's facial expression, posture, and movement of the head and body are all significant."

5 Conclusion

It has been the purpose of this paper to summarize some of the research that has been done into the nature of sign languages and thus to establish that there is already a well-founded international context within which research into Irish Sign Language must take place. Much work needs to be done

towards the description of Irish Sign Language, and if this paper helps to prevent Irish researchers from reinventing the wheel it will have served its purpose.

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APPENDIX A

ASL handshapes, the American manual alphabet, and Stokoe's notational system

(Reproduced from Stokoe et al. 1965/1976 by permission of the publisher, Linstok Press)

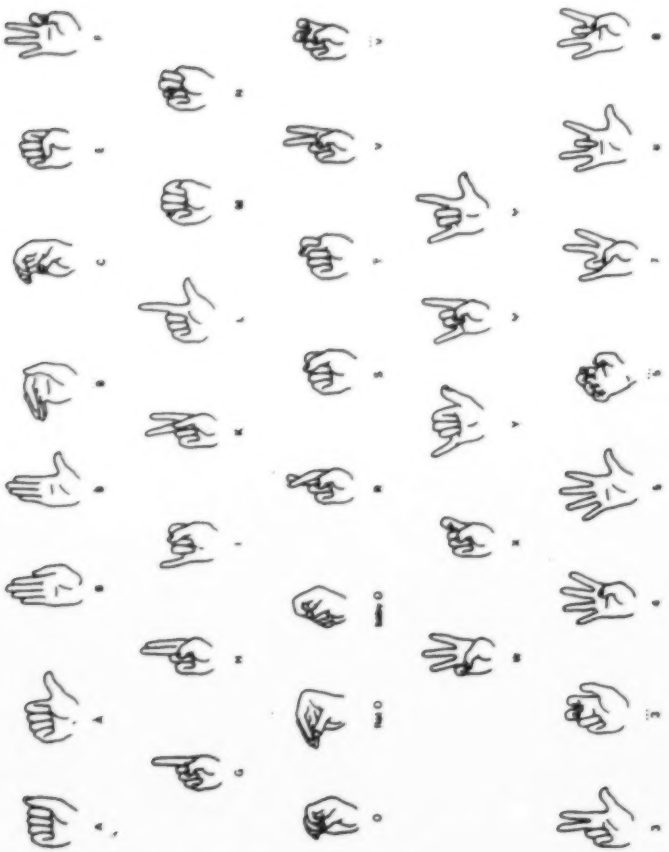


Figure 2-1. ASL handshapes (presented in an order allowing comparison with the Manual Alphabet in Figure 2-2).

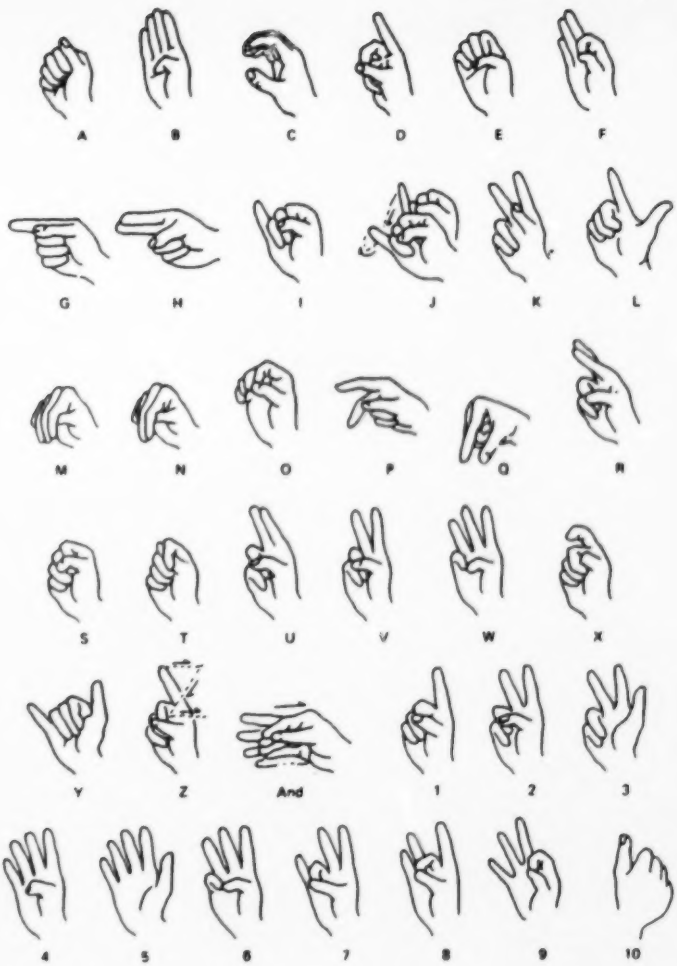


Figure 2-2. The American manual alphabet.

Table 2-1. *Symbols for writing the signs of the American Sign Language: DEZ symbols, some also used as TAB*

Symbol	Description
A	Compact hand, fist; may be like 'a', 's', or 't' of manual alphabet
B	Flat hand
5	Spread hand; fingers and thumb spread like '5' of manual numeration
C	Curved hand; may be like 'c' or more open
E	Contracted hand; like 'e' or more claw-like
F	"Three-ring" hand; from spread hand, thumb and index finger touch or cross
G	Index hand; like 'g' or sometimes like 'd'; index finger points from fist
H	Index and second finger, side-by-side, extended
I	"Pinkie" hand; little finger extended from compact hand
K	Like G except that thumb touches middle phalanx of second finger; like 'k' and 'p' of manual alphabet
L	Angle hand; thumb, index finger in right angle, other fingers usually bent into palm
3	"Cock" hand; thumb and first two fingers spread, like '3' of manual numeration
O	Tapered hand; fingers curved and squeezed together over thumb; may be like 'o' of manual alphabet
R	"Warding off" hand; second finger crossed over index finger, like "r" of manual alphabet
V	"Victory" hand; index and second fingers extended and spread apart
W	Three-finger hand; thumb and little finger touch, others extended spread
X	Hook hand; index finger bent in hook from fist, thumb tip may touch fingertip
Y	"Horns" hand; thumb and little finger spread out extended from fist; or index finger and little finger extended, parallel
8	Allocheric variant of Y; second finger bent in from spread hand, thumb may touch fingertip

Table 2-2. *Symbols for writing the signs of the American Sign Language: TAB symbols*

Symbol	Description
ø	Zero, the neutral place where the hands move, in contrast with all places below
⊂⊃	Face or whole head
⊂	Forehead or brow, upper face
⊔	Mid-face, the eye and nose region
∪	Chin, lower face
⌡	Cheek, temple, ear, side-face
⊓	Neck
[ ]	Trunk, body from shoulders to hips
↖	Upper arm
↙	Elbow, forearm
ɑ	Wrist, arm in supinated position (on its back)
ɒ	Wrist, arm in pronated position (face down)

Table 2-3. *Symbols for writing the signs of the American Sign Language: SIG symbols*

Symbol	Description	Action
∧	Upward movement	Vertical action
∨	Downward movement	
∿	Up-and-down movement	
>	Rightward movement	Sideways action
<	Leftward movement	
≷	Side-to-side movement	
↑	Movement toward signer	Horizontal action
↓	Movement away from signer	
⌶	To-and-fro movement	
ɑ	Supinating rotation (palm up)	Rotary action
ɒ	Pronating position (palm down)	
ω	Twisting movement	
η	Nodding or bending action	
□	Opening action (final DEZ configuration shown in brackets)	
#	Closing action (final DEZ configuration shown in brackets)	
⩋	Wriggling action of fingers	
ɑ	Circular action	
)(	Convergent action, approach	Interaction
x	Contactual action, touch	
⌶	Linking action, grasp	
+	Crossing action	
○	Entering action	
+	Divergent action, separate	
‘’	Interchanging action	

APPENDIX B

An alternative system for describing the formational properties of ASL

(Reproduced from Friedman 1977 by permission of the publisher, Academic Press)

TABLE 1. SUMMARY: PHONEMIC INVENTORY

Phoneme	Variant	Environment
/A/	*A*	
	Â	contact with thumb tip iconic signs
	S	side contact loans neutral end or initial shape
/O/	*O*	
	tapered-O	free variation
	bO	end shape (in double-shape signs with closure of *L*)
/B/	*B*	free variation
	B̂	free variation required in signs with thumb tip contact
	B̂	end shape in double-shape signs with *BEND KNUCKLES* movement
/C/	*C*	
/5/	*5*	
	4	plurality
	5̈	end shape in signs with *BEND FINGERS* movement
/5̈/	*5̈*	
/F/	*F*	
	bO	reduction
/G/	*G*	
/X/	X_1	
	X_2	contact with middle joint
/L/	*L*	
	L̈	end shape in signs with *BEND FINGERS* movement
	L w/bent thumb	iconic signs anchored index finger
/H/	*H*	
	Ḧ	palm-side contact

Phoneme	Variant	Environment
/V/	V	
	V̈	end shape with *BEND FINGERS* movement
		iconic signs
/V/	V	
/3/	3	
	3̈	end shape in signs with *BEND FINGERS* movement
/3̈/	3̈	
/Y/	Y	
	Y̆	reduction
	Y̊	assimilation
		iconic signs
/Ÿ/	Ÿ	
	Y̊	free variation
/8/	8	
	8	*CLOSE* or *OPEN* movement
/7/	7	
	unspread 7	
/T/	T	
/M/	M	
/N/	N	
/D/	D	
	bD	free variation
/E/	E	
/G_2/	G_2	
/K/	K	
/I/	I	
/W/	W	
/R/	R	

TABLE 2. MOVEMENT FEATURES

INTERACT		
	ALTERNATE	
	APPROACH	
	SEPARATE	
	CROSS	
	LINK	
	NONINTERACTING	
CONTACT		
	CONTINUOUS	CONTACT
	HOLDING	
	END	
	BEGINNING	
	DOUBLE	
	NONCONTACT	
DIRECTION		
	UPWARD	VERTICAL
	DOWNWARD	
	UP-AND-DOWN	
	RIGHT	HORIZONTAL WIDTH
	LEFT	
	SIDE-TO-SIDE	
	TOWARD	HORIZONTAL DEPTH
	AWAY	
	TO-AND-FRO	
	NONDIRECTIONAL	
MANNER		
	STRAIGHT	MACRO
	TWIST	
	CIRCULAR	
	BEND-FINGERS	MICRO
	BEND-KNUCKLES	
	BEND-WRIST	
	OPEN	
	CLOSE	
	WIGGLE	

TABLE 3. PLACE OF ARTICULATION

Place	Conditions of Occurrence
NEUTRAL SPACE	
HEAD	
WHOLE FACE	
WHOLE FACE	
TOP OF HEAD	iconic signs
UPPER FACE	
FOREHEAD	
SIDE-FOREHEAD	double articulator signs
EYES	iconic signs
SIDE-EYES	contact
NOSE	
CENTER	
UNDER	iconic signs
SIDE	double contact; twist
LOWER FACE	
CHIN	
MOUTH	iconic signs
(UNDER-CHIN)	
CHEEK	
CENTER	
SIDE	thumb tip contact
EAR	iconic signs
NECK	
CENTER	
SIDE	iconic signs
TRUNK	
CHEST	
CENTER	
STOMACH	iconic signs
WAIST	iconic signs
SHOULDER	
ARM	
UPPER ARM	
ELBOW	
DORSAL FOREARM	
VENTRAL FOREARM	
DORSAL WRIST	
VENTRAL WRIST	
HAND	

TABLE 4. ORIENTATION DEFINED

Hand Configuration	Orientation in the Direction of . . .
A	finger or palm-side
O	fingertips (palm)
B	palm and/or fingertips
B̂	palm
C	palm
5	palm and/or fingertips
4	palm and/or fingertips
5̈	palm
F	palm and/or fingertips
G	palm and/or fingertips
X	palm
L	palm and/or fingertips
H	palm and/or fingertips
V	palm and/or fingertips
V̈	palm
3	palm and/or fingertips
3̈	palm
Y	palm
8	palm
8	palm
7	palm
M	finger or palm-side
D	fingertips (palm)
E	palm
G_2	palm and/or fingertips
K	palm and/or fingertips
I	palm and/or fingertips
W	palm and/or fingertips
R	palm and/or fingertips

APPENDIX C

Citation forms of ASL signs

(Reproduced from Klima and Bellugi 1979 by permission of the publisher, Harvard University Press)

Figure 2.2 Minimal contrasts illustrating major formational parameters

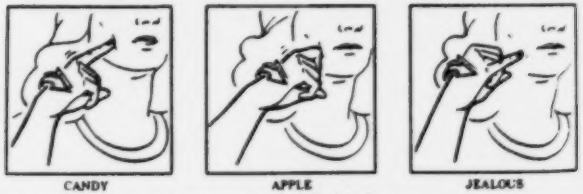


Figure 2.3 Two signs showing distinct Hand Configurations used in many ASL signs

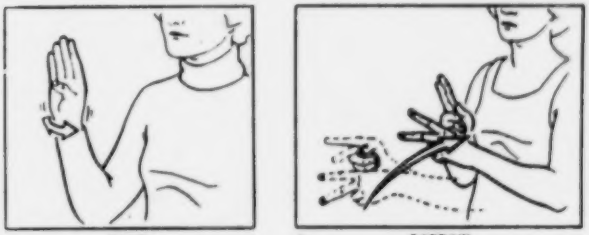
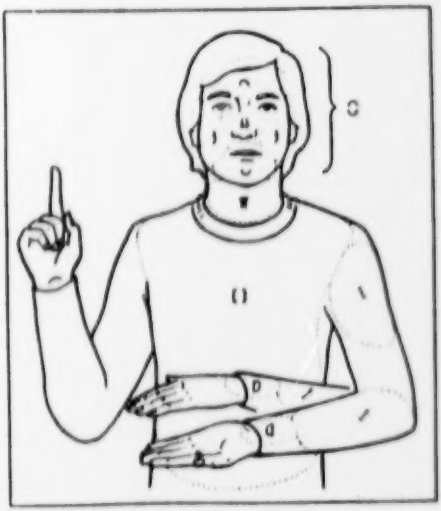


Figure 2.5 Hand Configuration primes arranged in order of frequency (with descriptive phrases used to refer to them).

Figure 2.12 The region in which signs are made.

Figure 2.13 Distinct Places of Articulation (symbols are those used to represent prime values in the DASL).



APPENDIX D

Woodward's feature system for describing handshapes

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Table 2-6. *ASL DEZ (handshape) symbols with tentative feature representation*

Distinctive feature	S	E	O	C	B	I	T	A	Ȧ	B̈	B_2	5̈	5	8	G	X	D	G_2	G̈	L
Closed	+	+	–	–	–	–	+	+	+	–	–	–	–	–	+	+	–	+	+	+
Thumb	–	–	–	–	–	–	–	+	+	+	+	+	+	+	–	–	–	+	+	+
Spread	–	–	–	–	–	+	–	–	+	–	–	–	+	+	–	–	–	–	–	+
Bent	–	–	–	+	–	–	+	–	–	+	–	+	–	+	–	+	–	–	+	–
Fore	–	–	–	+	+	+	+	–	–	+	+	+	+	+	+	+	+	+	+	+
Mid	–	–	–	+	+	+	–	–	–	+	+	+	+	–	–	–	–	–	–	–
Ring	–	–	–	+	+	+	–	–	–	+	+	+	+	+	–	–	–	–	–	–
Pinky	–	–	–	+	+	+	–	–	–	+	+	+	+	+	–	–	–	–	–	–
Contact	–	+	+	–	–	–	–	–	–	–	–	–	–	–	–	–	–	+	–	–
Crossed	–	–	–	–	–	–	+	–	–	–	–	–	–	–	–	–	–	–	–	–

Distinctive feature	I	Y	Ψ	Ψ	7	8	H	N	V	R	3	K	M	W	6	F_x	9	F	M_1	N_1
Closed	+	+	+	+	–	–	+	+	+	+	+	+	+	+	–	+	–	+	+	+
Thumb	–	+	–	+	–	–	–	–	–	–	+	–	–	–	–	–	–	–	–	–
Spread	–	+	–	+	+	+	–	–	+	–	+	+	–	+	–	–	+	+	–	–
Bent	–	–	–	–	–	–	–	+	–	–	–	–	+	–	–	–	–	–	+	+
Fore	–	–	+	+	+	+	+	+	+	+	+	+	+	+	+	–	–	–	+	+
Mid	–	–	–	–	–	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Ring	–	–	–	–	+	–	–	–	–	–	–	–	+	+	+	+	+	+	+	–
Pinky	+	+	+	+	+	+	–	–	–	–	–	–	–	–	–	+	+	+	–	+
Contact	–	–	–	–	+	+	–	–	–	–	–	–	–	+	+	+	+	+	–	–
Crossed	–	–	–	–	–	–	–	–	–	+	–	+	–	–	–	–	–	–	+	+

APPENDIX E

Derivational morphology in ASL

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Figure 1.5
Derivationally related sets of forms in ASL. (a) The formation of deverbal nouns. (b) Nominalizations from verbs. (c) Derivation of predicates from nouns. (d) Sentence adverbials from basic signs. (e) Characteristic predicates from basic signs. (f) Derivations for extended or figurative meaning. (g) Predicate form of the sign CHURCH meaning 'pious' and a related idiomatic derivative meaning 'narrow-minded.'

APPENDIX F

Inflectional morphology in ASL

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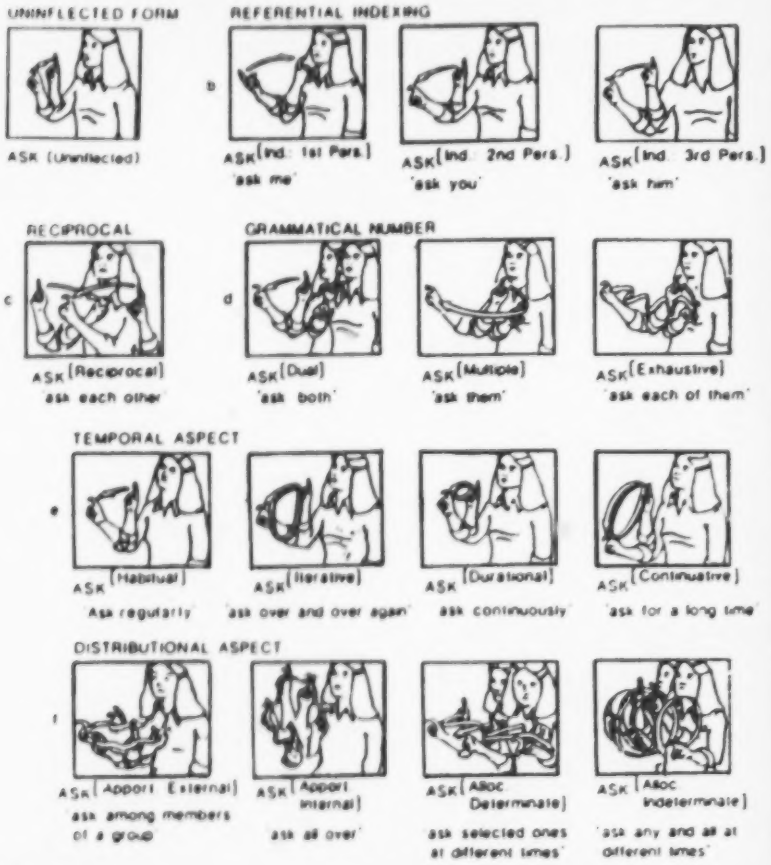

Figure 1.6
Layered inflectional processes in different grammatical categories stemming from a single root. (a) The uninflected sign ASK. (b) Distinctions of referential indexing. (c) A reciprocal form. (d) Marking for grammatical number. (e) Marking for temporal aspect. (f) Marking for distributional aspect.

APPENDIX G

Recursive devices in ASL

(Reproduced from Poizner et al. 1990 by permission of the publisher, MIT Press)

a GIVE (uninflected)

b GIVE [Durational]
give continuously

c GIVE [Exhaustive]
give to each

d GIVE [[Exhaustive] Durational]
give to each, that action
recurring over time

e GIVE [[Durational] Exhaustive]
give continuously to each in turn

f GIVE [[[Durational] Exhaustive] Durational]
give continuously to each in turn,
that action recurring over time

Figure 1.7
Recursive nesting of morphological processes in ASL. (a) The uninflected sign GIVE. (b, c) GIVE under single inflections. (d) One combination of inflections (Exhaustive in Durational). (e) Another combination of inflections (Durational in Exhaustive). (f) Recursive applications of rules (Durational in Exhaustive in Durational).

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